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CHAPTER 7.0 DATA SOURCES OF NURSING HOME NURSE STAFFING ANALYSIS, OSCAR: RELIABILITY AND VALIDITY ANALYSIS[1]

7.1 Introduction

HCFA's Online Survey and Certification Reporting System (OSCAR) provides staffing data for all certified nursing homes in the United States. The data are collected as part of the certification and annual recertification process. While some edit checks are performed by HCFA to identify survey errors, concerns remain about the accuracy and validity of staffing data from OSCAR.

In this study, staffing figures from a sample of nursing facilities in Ohio were used to assess the validity of OSCAR nurse staffing data. The payroll data were collected for the period corresponding to the most recently available OSCAR assessment, providing close to a "gold standard" measure of facility nurse staffing. This is the first data collection effort that captures both a similar definition and an identical time period as the OSCAR nurse staffing survey data, using an independently collected and not self-reported facility data source. As shown in Chapter 8, several types of comparisons were used to assess the validity of OSCAR data, including comparisons of mean staffing levels (both overall and for low-staffed facilities) and analysis of the correlation of staffing measures from OSCAR and the payroll data. The validity analyses showed considerable difference in staffing levels from OSCAR and payroll data for the same time period, suggesting that OSCAR staffing data for some facilities are unreliable. The correlation coefficient in a measure of total hours per resident day was less than 0.5. There was greater consistency in RN and LPN staffing figures than for nurses aides.

Few previous studies have examined the reliability of OSCAR staffing measures. Straker (1999) compared 1995 OSCAR data to 1995-1997 data from the Ohio Department of Health to determine the consistency between the two data sources in areas such as number of certified beds, resident count, and staffing levels. The study reported inconsistencies in resident count and staffing measures from the two data sources. For 1995, the correlation in total nursing hours per resident day was 0.61. An importance difference between this study and that of Straker is that Ohio payroll data used for the

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[1] This report was completed by Alan White of Abt Associates for the Health Care Financing Administration (Contract #500-95-0062-T.O.3; Allison Walker, Abt Associates Project Director; Marvin Feuerberg, HCFA Project Officer). Other individuals who made valuable comments and suggestions on the analyses included in this chapter include Karen Reilly, Donna Hurd, and Terry Moore of Abt Associates, Andy Kramer and Michael Lin of the University of Colorado Health Center on Aging and Division of Geriatric Medicine, University of Colorado Health Sciences Center, Denver, Colorado, and Marvin Feuerberg, HCFA Project Officer. Beth Klitch of Survey Solutions, Inc., supervised the collection of Ohio payroll data. Editorial assistance was provided by Ed Mortimore and Susan Joslin, HCFA.

present reliability and validity analyses were not based on self-reported staffing data and covered the same time period as OSCAR. The Ohio Department of Health survey data used by Straker were based on self-reported data that did not typically cover the same period as the OSCAR assessment. There are questions about whether the Department of Health data were an independent data source, given that some facilities may complete both data sources in the same manner, which may or may not be accurate. Unlike the Department of Health data, the payroll data were collected independently, and were not based on self-reported information.

A set of decision rules were developed to determine which facilities to exclude from analyses due to concerns about the accuracy of OSCAR data. Two types of decision rules were applied. The first were a set of "logical" decision rules which identify obvious data errors. These build on earlier work by Harrington (1996, 1998). Facilities with data that fail one or more of the logical decision rules should be excluded from analyses. The second set of decision rules are based on the consistency of reported staffing and resident levels across time. Implementation of these decision rules requires data from at least two periods. Use of these longitudinal decision rules allows some data from facilities with outlier staffing levels (excluding the extreme outliers identified by the logical decision rules that represent fairly obvious data errors) to be included in the analysis sample, assuming that these data can be validated based on data from other periods.

The longitudinal decision rules differ from those of Harrington in that they do not automatically exclude facilities with very high or very low staffing levels (other than extreme outliers that represent obvious errors). Using Harrington's decision rules, all facilities in the lowest 1% or highest 2% in staffing levels (per resident day) are excluded. This is particularly inappropriate for the current study, which is analyzing the relationship between staffing levels and resident outcomes, a relationship that might only be evident for facilities with very low staffing levels. The investigators also recommend against using Harrington's rule to exclude non-hospital based facilities with 50 or more empty beds. The current analyses suggested that staffing data for these facilities were no less reliable than for other facilities. Instead, the investigators propose excluding facilities that have a large change in residents across time (adjusting for changes in the number of beds at the facility).

Nationwide, the decision rules resulted in the exclusion of about 14% of facilities. Their application significantly improved the reliability of OSCAR staffing figures for facilities that were not excluded. The correlation in 1997 total hours per day from OSCAR and data from Medicaid Cost Reports, which were used to conduct tests of the concurrent validity of OSCAR data, improved from 0.13 to 0.55, and the correlation for the relatively small number of facilities with both OSCAR and Ohio payroll data improved from 0.43 to 0.54, after application of the decision rules. The decision rules were used for the analyses contained in this report.

There is anecdotal evidence that some facilities increase the number of staff immediately prior to the start of the annual certification survey (which is the period covered by OSCAR), and then decrease

staffing after the completion of the survey. If this type of behavior occurs, then the staffing levels reported in OSCAR would be unrepresentative of typical staffing levels, and some type of adjustment to OSCAR might be warranted. The payroll data were periods, one corresponding to the assessment period and the second for a period which typically covered the six months prior to OSCAR. Essentially no evidence was found from the payroll data that facilities in the Ohio payroll sample tended to increase staffing levels during the period covered by OSCAR. This lack of evidence is not necessarily inconsistent with the observations of certification staff that facilities are 'staffing-up' in anticipation of the survey– it may be that facilities increase staffing in ways that do not appear in the payroll data, such as bringing in staff from other facilities or using administrative staff to provide patient care. These additional staff would be irrelevant to this analysis, since they would not be recorded in either OSCAR or in the payroll data.

7.2 Data Sources

Data sources used in this study included OSCAR, Medicaid Cost Reports, and Ohio payroll data. The payroll data were collected for a sample of 107 facilities. Because of the small number of facilities for which payroll data were available, the investigators used Medicaid Cost Report data to test the impact of decision rules on the consistency of staffing measures from OSCAR and Medicaid Cost Report data. (Note that the Medicaid Cost Report data are examined in Chapter 8.) For most analyses in this chapter, 1996-97 staffing data from facilities in New York, Ohio, and Texas for which Medicaid Cost Report data were available was used. National OSCAR data were used to show the impact of the proposed decision rules.

7.2.1 Description of Ohio Payroll Data Collection

7.2.1.1 Purpose

The staffing study required data from a large number of facilities to adequately conduct the analyses. The only national sources for staffing data are Medicaid Cost Reports and data from OSCAR. The payroll data collection activity of this project was designed to provide a "gold standard" measure of the accuracy of staffing data contained in the OSCAR system for a sample of facilities included in the larger-scale comparison of OSCAR and Medicaid cost report data.

7.2.1.1.1 Overview of Methods

This activity was accomplished through a subcontract between Abt Associates and Survey Solutions, Inc. (SSI). SSI, a long term care management consulting and accreditation company, hired experienced nursing home administrators to serve as data collectors. These consultants entered sampled facilities and reviewed their payroll records for two time periods: 1) the time period reported in the most recent OSCAR data available; and 2) a two-week period of time up to six months prior to the

most recent survey. Data for the second time period were collected to test the hypothesis that facilities "staff-up" prior to the annual state survey. Data collected included paid nursing hours for all permanent employees as well as hours paid to temporary staff. Average daily census was also collected for the two time periods corresponding to the payroll data collection. Participation in the payroll data collection activity was voluntary, with SSI handling all of the contacts and recruiting of facilities.

7.2.1.2 Background

7.2.1.2.1 Staffing Definitions

Staffing levels are generally established by a combination of clinical and financial personnel who collaborate to compile a budget for each facility. Since direct care staffing accounts for typically 65% - 80% of a facility's total expenditures, accurate budgeting requires a detailed projection of direct care staff levels. Most facilities define direct care staff to include Registered Nurses (RNs), Licensed Practical or Vocational Nurses (LPNs/LVNs), and Certified Nursing Assistants (CNAs). Staffing levels are most commonly expressed throughout the nursing home industry in terms of Per Patient Day (PPD) nursing hours, rather than a less precise measure such as staff to resident ratios, e.g., 1:12. A PPD unit counts the average number of nursing hours budgeted and/or delivered per patient per day.

7.2.1.2.2 Determining Adequate Staffing: Use of Acuity Measures

Generally, staffing levels are broadly established to reflect resident acuity. While there is no single widely-accepted measure used to precisely adjust nursing hours relative to resident acuity, there is nearly universal recognition that the average measure of nursing hours per patient day may vary considerably with the acuity levels of residents. For example, a nursing facility with a typical population of residents with declining Activities of Daily Living (ADLs), dementia, and multiple chronic diseases may well meet residents' needs with an average daily PPD level of 3.5 hours of nursing time. Conversely, a facility caring for a subacute population including residents who are technology-dependent, e.g., ventilators, residents receiving end-of-life care, feeding tubes, and/or residents with severe, unstable medical conditions may barely meet residents' needs with an average daily PPD level of 4.5 hours of nursing time.

7.2.1.2.3 Staffing Challenges: Recruiting and Retaining Staff

Nursing facilities, once they have established a budgeted, average PPD level, then face the challenge of recruiting, training, supervising, and retaining sufficient numbers and types of qualified, experienced staff to fill the budgeted positions. With unemployment rates as low as 2% to 3% in many urban, suburban, and even rural areas, nursing facilities have significant difficulty achieving budgeted staffing levels. Many facilities have raised hourly wages to compete with other service industries hiring the same types of employees, offer a "signing bonus" of $100 - $1000 to attract new staff, and/or offer a "referral bonus"

to current staff to encourage referrals of new staff. Most facilities are offering fairly comprehensive benefit packages, including health insurance, dental, vision, short-term and long-term disability insurance, retirement plans, and even stock options.

Nursing facilities face other obstacles to full staffing, including requirements for criminal background checks and reference checks, drug and alcohol testing policies, lack of on-site nursing assistant training programs, the 24-hour/day, seven day/week nature of nursing care schedules, the pervasively poor image of nursing home quality, the extensive documentation procedures required, the difficulty of caring for severely cognitively impaired residents, and the potential for injury.

National turnover rates for CNAs averaged 93.3% in 1997. This statistic means that virtually every CNA position "turned over" during the year. Average national turnover rates in 1997 were 50.6% for RNs and 51.3% for LPNs/LVNs.[2] . Therefore, not only do nursing facilities face difficulty attracting qualified staff, but retaining those staff is equally as difficult.

7.2.1.2.4 Mechanics of Scheduling

The Director of Nursing (DON) and her designee is typically responsible for developing and maintaining a daily, weekly, biweekly, or monthly schedule for all nursing staff, including RNs, LPNs/LVNs and CNAs. The actual working schedule generally shows the number and types of all staff planned to work on each shift and for each unit or floor of the facility.

Frequently, the planned schedule must be adjusted to reflect staff who either do not show up to work the assigned shift and/or do not call in with an acceptable excuse for missing work. These occurrences, referred to as "no-call, no-shows," contribute to unanticipated staffing shortages. Therefore, it is not unusual for a working schedule to be marked up with notes related to both planned and unplanned absences, staff willing to work a second consecutive shift, and temporary staff who must be called in to cover unanticipated absences.

If a facility is having an exceptionally difficult time recruiting staff, the DON may call a temporary staffing agency in advance to schedule temporary staff to work shifts for which the facility has been unable to hire staff. Frequently, temporary staffing agencies in the geographic area are unable to fully supply all facilities' requests for temporary staff. It is not unusual for facilities to ask staff such as LPNs to "work aide duty," agreeing to pay the higher LPN hourly wage for this service. Administrative staff such as the DON, the MDS Coordinator, and Unit Managers are frequently pressed into service to "work charge nurse duty," pass medications, perform treatments, or act as shift supervisor.

Some facilities make up new schedules quite frequently, such as every two weeks, or monthly, thus

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[2] Buck Consultants Survey of Managerial, Supervisory, and Staff Positions in Nursing Homes, 1997

creating significant unpredictability for direct care staff. Other facilities utilize a "permanent assignment" scheduling plan that creates permanent schedule slots, such as 7:00 AM to 3:00 PM on Mondays through Fridays, thus improving the predictability for direct care staff. Yet other facilities utilize a 4-4-2 schedule that requires a staff member to work four days each week of a biweekly pay period, and then to work every other weekend.

Some facilities utilize permanent, part-time staff to fill weekend staffing slots, others require all staff to work every second or third weekend. Most facilities permanently assign staff to one of either two or three shifts. Facilities with three shifts offer a choice of days, evenings, or nights. Days are typically 7:00 AM until 3:00 PM, or perhaps 6:00 AM until 2:00 PM. Evenings are usually 3:00 PM until 11:00 PM or occasionally 2:00 PM until 10:00 PM. Nights are considered 11:00 PM until 7:00 AM or sometimes 10:00 PM until 6:00 AM. Some facilities require a ½ hour shift overlap to encourage communication between the members of the off-going and the on-coming shifts. Other facilities, because of concerns about overtime liability under federal wage and hour work rules, require employees to "clock out" within 5 minutes of the end of a shift, thus discouraging inter-shift communication. Sometimes facilities schedule 12-hour shifts, rather than the more typical 8-hour shifts, generally from 7:00 AM until 7:00 PM and 7:00 PM until 7:00 AM. Infrequently, facilities may have some direct care staff working 8-hour shifts and others working 12-hour shifts simultaneously. Weekend shifts are often different lengths and may have varying start times due to the increased difficulty of obtaining staff to work these less desirable shifts.

Facilities experience an exacerbation of staffing problems at certain times of the year, such as during summer vacation periods, holidays, local events such as festivals, winter weather, Mondays, and non-payday Fridays (for those facilities with biweekly payroll frequency). Many facilities offer a payroll bonus or hourly wage differential pegged to perfect attendance during a payroll period, e.g., the hourly wage for a CNA may be $7.50 per hour, with an extra $1.00 per hour if the CNA works all scheduled shifts during the two-week payroll period, thus raising the effective wage to $8.50 per hour. Facilities routinely offer double-time pay for staff willing to work holidays such as Christmas and Thanksgiving.

7.2.1.3 Payroll Data Collection Activity

7.2.1.3.1 Sampling

The sample of facilities selected for participation in the study was drawn by Abt Associates, using OSCAR data to group facilities into one of four staffing categories based on the total hours of nursing time per patient day reported in OSCAR. The facility identifying information, most recent survey date, and staffing categorization were provided to SSI, who entered this information into a database, color-coding the facilities according to their reported staffing category. The SSI field consultants utilized laptop computers loaded with the color-coded database to collect payroll data. In addition, the data collectors complied information on the time spent in data collection. The data collectors did not know

which staffing category related to which color, so as not to bias the data collection effort; they were simply instructed to complete data collection in a certain number of facilities from each color group.

7.2.1.3.2 Data Collectors

SSI selected three experienced, Ohio-licensed nursing home administrators to perform the data collection task. It was decided by the project team that administrators would be the most appropriate people to use for this activity because of their familiarity with the types and locations of required documents and because it was expected that they could form a collegial bond with the administrators of sampled facilities (from whom they would need to obtain permission for data collection). The three individuals selected for this task were drawn from the Northeast, Central/Northwest, and Southwest regions of Ohio to reflect geographic concentrations of nursing facilities in the sample and to minimize travel time.

7.2.1.3.3 Facility Recruitment

Because participation in the study was voluntary for facilities, a process was developed for use by SSI to maximize the likelihood of facility agreement to participate. SSI, Abt, and HCFA each prepared a formal letter of authorization explaining the study's purpose, emphasizing the confidentiality of all data to be collected, and requesting the facilities' cooperation. SSI administrative staff faxed copies of all three letters to each facility selected from the larger sample framework. In order to do so, each facility needed to be contacted by telephone to obtain their fax numbers. In collecting this information, SSI staff also verified all of the facility identifying information that was obtained from the OSCAR database during sampling. Faxing, rather than mailing, the introductory letters was selected as the most effective means for contacting facilities in light of the time constraints and importance of the study.

Within the next several days following each fax, the SSI data collectors placed telephone calls directly to each facility administrator and requested an appointment for data collection. Scheduling an appointment with the administrator in advance was determined to be the most effective way of ensuring that he/she would give consent, be present at the time of data collection, and authorize review of all necessary materials. Initially, the data collectors attempted to make "cold calls" to facilities, arriving following the facilities' receipt of the letters, but without a pre-scheduled appointment. The data collectors found that it was difficult to see the administrator and complete data collection under these circumstances and the approach was discontinued.

There were very few outright refusals to participate in the study. Among the facilities contacted that did not participate, the most common reasons were time and logistic difficulties in setting up appointments with administrators. Several facilities that are part of large, national, multi-facility organizations stated that they were unable to participate without corporate authorization. SSI then contacted the designated corporate officials directly and secured permission for these facilities to participate. A number of

facilities contacted the SSI office to confirm the details of the study after receiving the letters and/or phone calls from the data collectors. Other facilities that heard about the project called to volunteer even though they were not in the sample selected.

In some cases, there were difficulties with communications between the data collectors and facilities for the purpose of scheduling appointments, as the data collectors were in the field for the duration of the activity, making it complicated to leave messages for administrators and receive timely responses. With regard to the lowest-staffed category of facilities, who were of particular interest to HCFA for this study, however, at least four separate attempts were made by a combination of the data collectors and SSI office staff to confirm an appointment with each of these facilities. In the process of trying to schedule these facilities, SSI learned that some of them had been closed.

OSCAR data were used to stratify Ohio facilities into one of four categories, based on total nursing hours per resident day. Consideration was also given to ensure facility variation with respect to size, geographic distribution, for profit/not for profit status, and chain affiliation, although these stratification requirements were less stringent. In all strata, except for the nursing hours per resident per day, the facility sample distribution generally parallels the Ohio facility distribution or facility average. Practical constraints limited the total sample to 107 facilities. Initially, 1997 OSCAR data were used to stratify facilities, but Abt gained access to the 1998 OSCAR data during the data collection process, and an updated facility category listing was generated using this more recent survey data. The goal was to select a stratified random sample based on facility staffing levels, using the following sample distribution.

Category 1:	Less than 2.0 total nursing hours per resident per day; 31 facilities;
Category 2:	2.0 - 2.5 total nursing hours per resident per day; 21 facilities;
Category 3:	2.6-3.6 total nursing hours per resident per day; 21 facilities;
Category 4:	Over 3.6 total nursing hours per resident per day; 34 facilities.

Low-staffed facilities were over-represented in the sample design. In 1998, only 3% of Ohio facilities fell into Category One, 11% in Category 2, 59% in Category 3, and 27% in Category 4 (These figures are based on 1998 OSCAR data for Ohio facilities, before the application of any of the decision rules discussed later in this chapter).

Low-staffed facilities were over-sampled in order to evaluate the reliability of OSCAR among low-staffed facilities. As a result, the payroll sample is not representative of Ohio facilities. Ohio had few facilities in Categories 1 or 2, and, based on staffing levels, the payroll sample was actually more representative of nursing homes nationwide than it is of Ohio facilities. Nationwide, nearly 8% of facilities had fewer than two nursing hours per resident day, while 17% had between 2.0 and 2.5 total hours, 53% used between 2.5 and 3.6 total hours, and 22% used 3.6 or more total nursing hours per resident day.

Due to an insufficient number of available facilities within the lower category strata[3], facilities denying access for data collection, and the potential for the facility category to be redefined based on more current OSCAR data this strict facility category numbers were not maintained. However, the final sample yielded a general distribution of low versus high staffed facilities as originally designed (i.e., Category One n=8; Category Two n=24; Category Three n=40; and Category Four n=35). The investigators attempted to acquire data on more low staffed facilities, but were not able to due to facility refusals. An ongoing dialog with the government project officer was maintained during these strata adjustments to ensure the integrity of the final facility sample was maintained, especially in terms of its application in resident outcomes analyses.

7.2.1.3.4 Data Collection Process

When data collectors arrived at the facility, they met with the administrator and requested the necessary payroll and financial records. It was determined in consultations between SSI, Abt, and HCFA that the most comprehensive and accurate information about actual staffing patterns is best elicited by reviewing both permanent employee payroll records and temporary staff hours as reflected in agency invoices. While a nursing facility's working schedule is an accurate, if ever changing, plan for direct care staffing, the most accurate source of information indicating actual employee staffing levels/hours worked and paid is the payroll journal. These payroll records are based upon employee time cards or other records indicating the exact amount of time worked for each day's shift. Most facilities are quite careful about recording and maintaining payroll records accurately due to federal wage and hour requirements. Payroll records are usually categorized by department, such as nursing, and are further categorized by employee type, such as Director of Nursing (DON), administrative nurses, Registered Nurses (RNs), Licensed Practical or Vocational Nurses (LPNs/LVNs), and Certified Nursing Assistants (CNAs). While payroll frequency varies from weekly, biweekly, semi-monthly, and monthly, the most common frequency is biweekly. Facilities generally maintain six months to a year of payroll data in the facility, easily accessible for review.

Payroll records for direct care staff hired through temporary staffing agencies are found in a different set of financial records, usually Accounts Payable invoices submitted by the agency weekly, biweekly, or monthly. These invoices generally list the categories of staff utilized during the applicable period, as well as the dates, shifts, and hours worked by each temporary staff member.

While on-site at the facility, the data collectors reviewed both of these sources of information (payroll journal and staffing agency invoices) for the period that corresponded to the most recent facility survey by the state, so as to examine data for the same time period that should have been reported by the facility on the HCFA-670 form, contained in the OSCAR database. In addition, data collectors

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[3] In 1998, there were only 15 Ohio facilities that had fewer than 2.0 total nursing hours per resident day (excluding Directors of Nursing), after applying the OSCAR decision rules developed in this chapter.

requested the same payroll and staffing agency information for a two-week period six months prior to the most recent survey date. If the payroll journals and invoices from that period were not available in the facility (e.g., had been removed to off-site storage), then the data collectors requested data for a two-week time period as far back to the most recent survey that the facility maintained in-house.

The data collectors reported that the data needed to complete the items contained in the database were universally available at the facilities visited and that, on average, the data collection process took approximately 30 to 40 minutes per facility, from the time the data collectors obtained the appropriate payroll records to be reviewed. They noted that the process was not perceived by facility staff to be highly intrusive or onerous. Both the employee payroll data and the temporary staffing agency invoices were simple to identify and to review. Because the facility data sources list staff according to the same categories that were of interest and contained in the database created for this task, there were no judgment calls that needed to be made by the data collectors on site – the data elements were recorded exactly as they were found in facility records.

7.2.2 Online Survey and Certification Reporting System (OSCAR) Data

The Health Care Financing Administration's Online Survey Certification and Reporting System (OSCAR) database contains information on every nursing home in the United States that is certified by Medicare and/or Medicaid. The data are collected by the state survey and certification agencies at the time of the facility's survey (performed at least annually). The survey form instructs the facility to calculate the number of staff hours worked in the last 14 days[4]. Full time status is defined as 35 or more hours worked per week; part time status is less than 35 hours per week. Contract staff includes individuals and organizations under contract. The OSCAR data are based on data that are self-reported by facilities and input with minimum edit checks.

Typically, facilities are surveyed annually, as recertification must occur no less often than every fifteen months. Some facilities are surveyed more than once in a given year if there are substantial changes in a facility's organization or because of complaints about the quality of care. OSCAR calendar year files contain all facility surveys performed during that year. The beginning date of the facility's survey determines the calendar year into which the facility survey data will fall.

OSCAR staffing variables are reported in terms of FTE equivalents based on a 35 hour work week over a two week period. The conversion from FTEs to staff-hours-per-resident-day was made by summing staff types within each staffing category (e.g., LPN hours per resident day were calculated as

[4] Note that there is some ambiguity about the time period to be recorded in OSCAR. The instructions call for facilities to use a two week period to calculate hours worked, but facilities that do not use a two week payroll period may record hours corresponding to the payroll period rather than a two week period. This is a potential source of error in the OSCAR data.

the sum of full time LPN full-time equivalents (FTEs), part time LPN FTEs and contracted LPN FTEs) per day for the period covered by OSCAR. Total nurse staff hours per resident per day was calculated by dividing the total staff hours per day by the average daily number of residents recorded in OSCAR. There is some ambiguity about how the number of residents is recorded in OSCAR– for example, facilities may differ with respect to how they report residents that were hospitalized during the period covered by OSCAR.

Two analytic samples were used for this study. OSCAR data from 1995-1999 were used in the study. Cleaned data for calendar year files 1995 through 1997 for Ohio, New York, and Texas were provided by Mick Cowles, of Cowles Research Group. The cleaning process involved deleting duplicate records, back-filling clearly erroneous data fields through a series of logic edits, and retaining only nursing home and skilled nursing facility observations. OSCAR data from 1998-1999 were extracted from the HCFA Data Center for facilities in the payroll sample.

7.2.3 Medicaid Cost Reports

Medicaid Cost Report data were obtained directly from New York, Texas, and Ohio for the years 1995, 1996 and 1997. Cost report data provide a comprehensive listing of facility staffing and cost variables used by the state for facility reimbursement and accounting purposes. Facilities report their costs annually to their state reimbursement agency, and states may use penalties against facilities misreporting data. Because the cost reports are desk audited and associated with facility reimbursement and because there are punitive measures associated with misrepresenting information, the Medicaid cost report data are considered quite accurate, certainly more accurate than OSCAR (see Chapter 8 for a comparison of the reliability of OSCAR and Medicaid Cost Report data.) It is important to note that, even if both the OSCAR and Medicaid Cost Report data were accurate, facilities could have different staffing levels reported in the two sources, given the different time periods that they cover. The Medicaid Cost Report data were used to test the effects of potential decision rules, since these data were available for a larger sample than were the payroll data.

7.3 Methods

7.3.1 Assessing the Validity and Reliability of OSCAR Data

The validity of OSCAR data was evaluated by comparisons with the Ohio payroll data. Payroll data from the period corresponding to the most recently available OSCAR assessment was acquired (This was in either 1998 or 1999). Several types of comparisons were made to assess the validity of OSCAR:

- *Comparisons of mean staffing levels*, both overall and for facilities on the low end of the staffing distribution. The payroll data were used to identify low-staffed facilities for the validity

analyses discussed in this report. In addition to analyzing total nursing hours per resident day, the investigators also separately analyzed RN, LPN, and nurses aide hours per resident day.

- *Correlation analysis.* Correlation coefficients are a measure of the strength and direction of the linear relationship between two variables. The correlation between staffing measures from the three data sources was examined using Pearson and Spearman correlation coefficients and Kendall's Tau, another measure of association between variables.

  The Pearson correlation coefficient is calculated as the square root of the R-squared obtained by regressing one variable on the other. A coefficient of one indicates a linear relationship between the two variables, while a correlation coefficient of zero indicates that no relationship between the two variables is present.

  The Spearman correlation coefficient is the correlation of the *ranks* of the variables. Because the Pearson correlation coefficients may be greatly affected by outliers, which contribute disproportionately to the total variance of reported staffing measures, the Spearman correlations are a useful complement to the more commonly used Pearson correlation coefficients.

  Kendall's Tau-b is a measure of association between ordinal variables. It is based on the number of concordant and discordant pairs of observations and uses a correction for tied pairs. The weakness of Tau-b is that it is difficult to interpret as a measure of association (or reduction in error of prediction).

- *Categorical analysis.* Categorical variables (e.g., the facility's quartile rank of a given staffing measure) were used to assess the validity of OSCAR.

7.3.2 Assessing the Impact of Decision Rules

The payroll data were useful for comparing the validity of OSCAR data, but because these data were only available for about 100 facilities, it was not always possible to measure the impact of potential exclusion rules on the reliability of OSCAR staffing measures for non-excluded facilities. As a result, the Medicaid Cost Report data were used to measure the impact of decision rules on the reliability of OSCAR, using a variety of measures.

7.4 Comparison of Staffing Measures from OSCAR and Ohio Payroll Data

Comparison of staffing measures from OSCAR to those from the payroll data, which provide close to a "gold standard" measure of facility nurse staffing, is important for understanding the overall validity of OSCAR data. The analyses in this section used OSCAR data for all facilities in the payroll sample,

without applying the decision rules described below (In Section 7.5, the payroll data were used to measure how the application of exclusion criteria affect the consistency of OSCAR data for the remaining sample.) Note that for the analyses described in this section, nine facilities were excluded because the OSCAR and payroll data did not cover the same time period.

7.4.1 Analysis of Average Staffing Levels

Mean staffing levels from OSCAR and the payroll data were similar (Table 7.1). The largest difference was for RN hours per resident day, which were 0.56 in the payroll data and 0.46 in OSCAR. It is important to note that the similar mean figures do not imply that staffing measures from the two data sources are necessarily consistent, as there may be large differences in staffing values for individual facilities that are masked by mean staffing levels.

Because of the interest in the identification of a potential minimum staffing level below which residents are at increased risk of poor outcomes, facilities on the low end of the staffing distribution were emphasized in the validity analyses. Among facilities that ranked in the bottom quartile in terms of total hours per resident day, mean staffing measures from OSCAR were somewhat higher than those from the payroll data, particularly for nurses aides. Total nursing hours for these facilities were 2.48 in OSCAR compared to 2.36 in the payroll data. Mean RN hours for these facilities were higher in the payroll data (0.39 compared to 0.30 in OSCAR), but mean nurses aide hours were much higher in OSCAR (1.65 hours) than in the payroll data (1.43 hours).

Table 7.1:
Comparison of Reported Staffing Levels from Ohio Payroll Data to OSCAR– Average Staffing Levels

	Mean hours per resident day (standard deviation)	
	Ohio payroll data	**OSCAR**
All facilities		
Total hours per resident day	3.46 (1.52)	3.39 (1.68)
RN hours per resident day	0.56 (0.56)	0.46 (0.54)
LPN hours per resident day	0.83 (0.60)	0.79 (0.39)
Nurses aide hours per resident day	2.08 (0.75)	2.13 (1.16)
Low staffed facilities- Bottom quartile in total nursing hours per resident day		

Table 7.1: Comparison of Reported Staffing Levels from Ohio Payroll Data to OSCAR– Average Staffing Levels		
	Mean hours per resident day (standard deviation)	
	Ohio payroll data	**OSCAR**
Total hours per resident day	2.36 (0.40)	2.48 (0.81)
RN hours per resident day	0.39 (0.19)	0.30 (0.14)
LPN hours per resident day	0.55 (0.26)	0.54 (0.23)
Nurses aide hours per resident day	1.43 (0.45)	1.65 (0.63)
N= 98; 25 in lowest quartile. Sources: Ohio payroll data, OSCAR		

7.4.2 Consistency of Staffing Measures

Figures 1-4 compare staffing measures from OSCAR and the payroll data. The figures show that staffing figures are quite comparable for some facilities (facilities with staffing figures that lie on the diagonal lines of Figures 1-4 have identical staffing data for the two data sources). There are other facilities, however, for which there are large differences in staffing levels. These include not only facilities with outlier staffing values, which will be excluded by the decision rules described below, but also other facilities which are much less likely to be excluded by the decision rules.

There was less consistency in nurses aide staffing figures (Figure 4) than for either RNs (Figure 2) or LPNs (Figure 3). The payroll sample included four facilities for which OSCAR reported no nurses aide hours per resident day, figures that were contradicted by the payroll data.

7.4.2.1 Correlation Analysis

The correlation between staffing figures from OSCAR and the payroll data were relatively low. For total hours per resident day, the Pearson correlation coefficient was 0.43, and the Spearman (rank) correlation was 0.52. For individual staffing categories, the correlation between OSCAR and the payroll data were higher for RN and LPN hours per resident day than for nurses aides (Table 7.2).

There was little relationship in staffing measures from the two data sources among facilities in the lowest quartile of total hours per resident day (based on the payroll data). The Pearson correlation coefficient in total hours per resident day was negative for these facilities, while the Spearman correlation

coefficient was 0.08. The correlation coefficients for individual staffing categories was somewhat higher, especially for RNs and LPNs.

The relatively low correlation coefficients suggest the presence of inaccurate data in OSCAR, underscoring the importance of developing a set of decision rules for which facilities could be excluded from analyses. One criteria for evaluating decision rules is how their impact on the correlation between OSCAR and payroll data for facilities that are not excluded.

7.4.2.2 Analysis of Categorical Staffing Measures

The investigators also analyzed the consistency of staffing measures from OSCAR and the payroll data using categorical measures of staffing based on the facility's quartile rank in total hours per resident day from OSCAR and the payroll data. Analogous measures of the facility's quartile rank for RN, LPN, and Nurse Aide hours per resident day were also compared to the payroll data. Clearly, there were some facilities which were inconsistently classified in the two data sources:

- For total staffing hours per resident day, twenty percent of facilities in the lowest quartile in the payroll data were in one of the top two quartiles based on OSCAR (Table 7.3, adding up the third and fourth quartile figures).

- Of facilities classified in the lowest quartile of total staffing hours by OSCAR, 8% were in the third highest quartile, and 16% in the top quartile, based on the payroll data.

- For total nurse aide hours per resident day, twenty nine percent of facilities in the lowest quartile in the payroll data were in one of the top two quartiles based on OSCAR (Table 7.3C).

On the other hand, the OSCAR categorical staffing measures appear relatively good for RN and LPN staffing:

- 58% of facilities in the lowest quartile for RNs in the payroll data were also in the lowest quartile for OSCAR; 75% of the top quartile in the payroll data were also in the top quartile in OSCAR (Table 7.3A).

- For LPNs, 63% of the lowest quartile in the payroll data were also in the lowest quartile for OSCAR; 79% of the top quartile were also in the top quartile for OSCAR (Table 7.3B).

Depending on the degree of accuracy needed, the OSCAR categorical staffing measures may be adequate, particularly for RN and LPN hours.

Figure 7.1: Total hours per resident day from OSCAR and Ohio payroll data

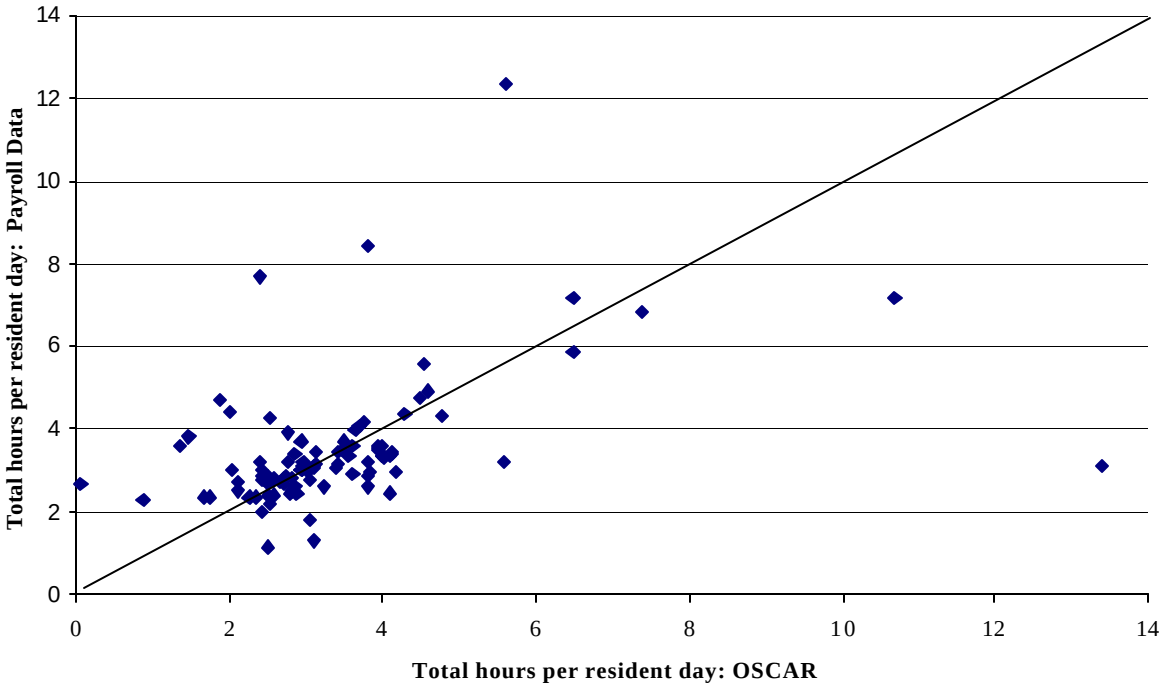

Figure 7.2: RN hours per resident day from OSCAR and Ohio payroll data

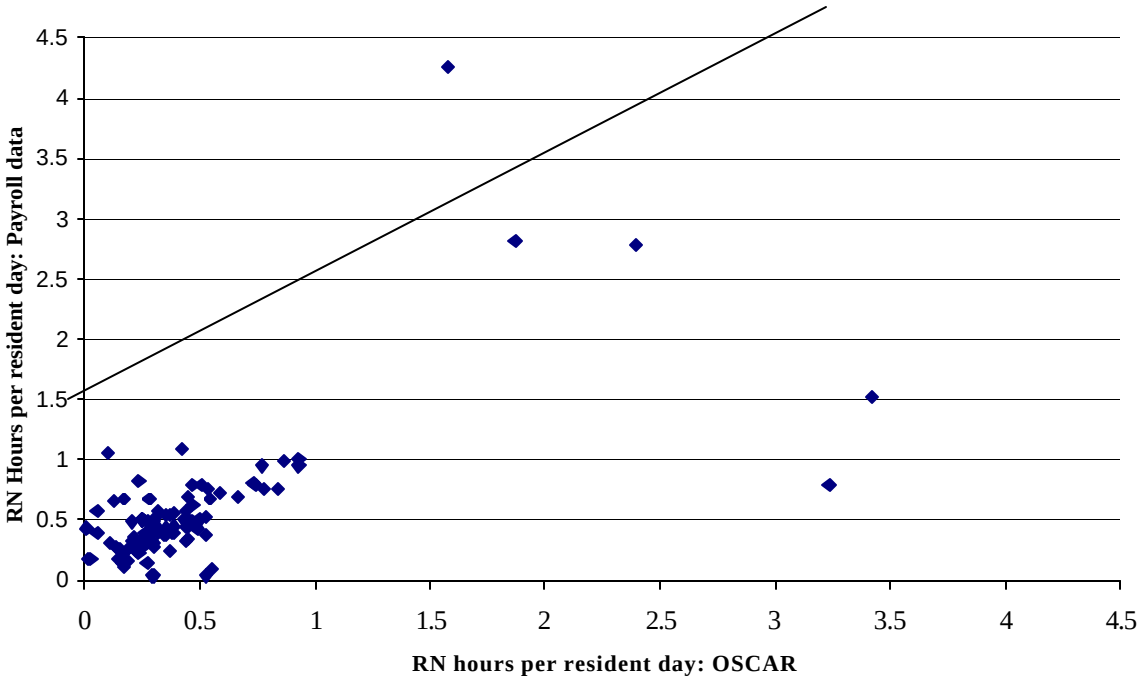

Figure 7.3: LPN hours per resident day from OSCAR and Ohio payroll data

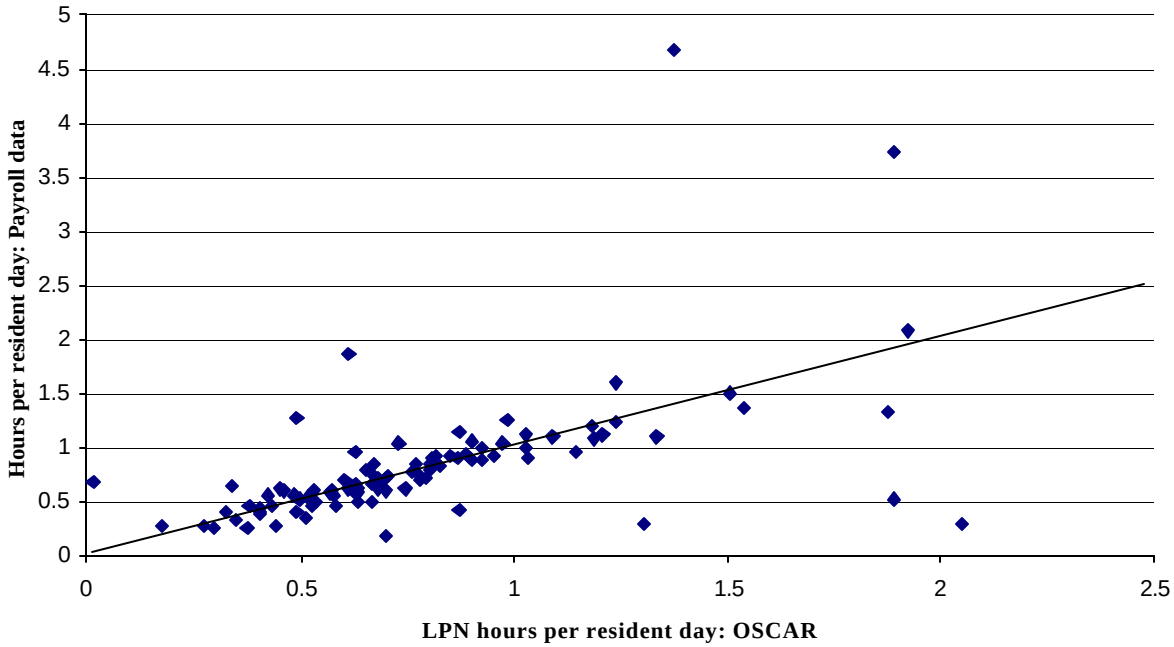

Figure 7.4: Nurses aide hours per resident day from OSCAR and Ohio payroll data

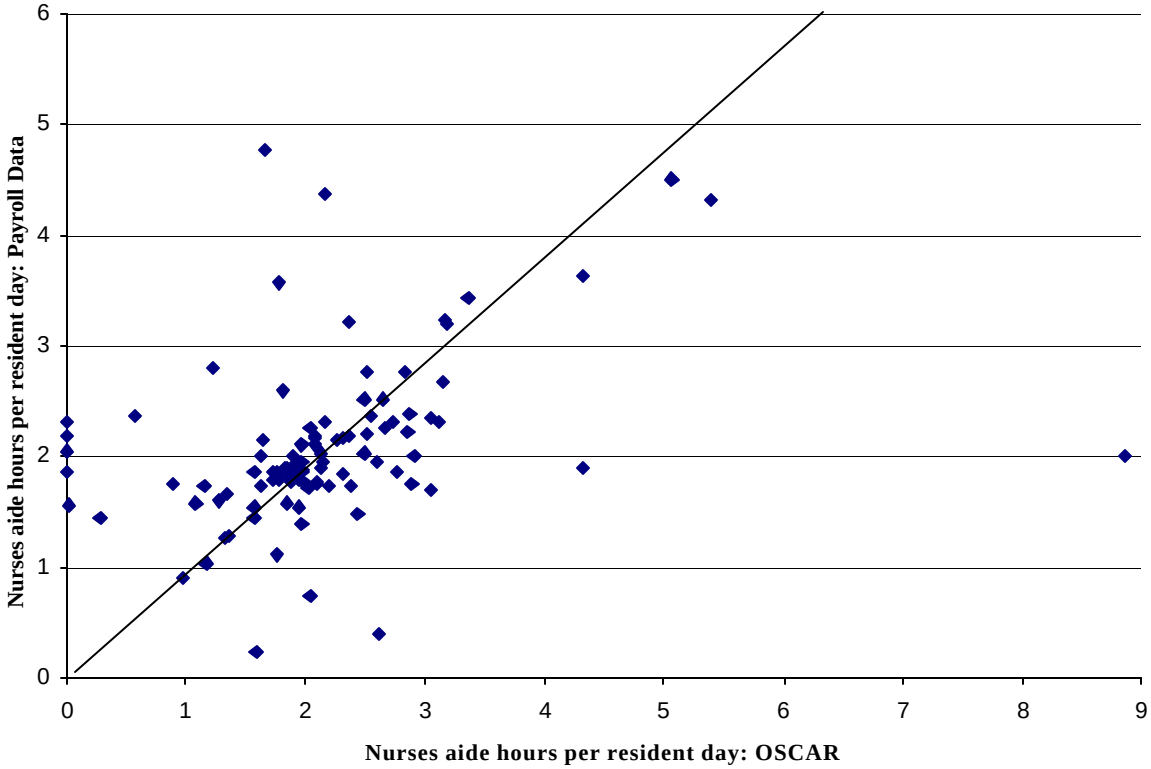

Table 7.2:
Comparison of Reported Staffing Levels from Ohio Payroll Data to OSCAR– Correlation Coefficients

	Correlation coefficient		
	Pearson	**Spearman**	**Kendall's Tau-b**
All facilities			
Total hours per resident day	0.43	0.52	0.40
RN hours per resident day	0.63	0.59	0.46
LPN hours per resident day	0.55	0.71	0.60
Nurses aide hours per resident day	0.36	0.46	0.34
Low staffed facilities- Bottom quartile in total nursing hours per resident day			
Total hours per resident day	-0.10	0.08	0.05
RN hours per resident day	0.28	0.38	0.29
LPN hours per resident day	0.61	0.55	0.43
Nurses aide hours per resident day	0.02	0.27	0.18

N= 98
Sources: Ohio payroll data, OSCAR

Table 7.3:
Comparison of Reported Staffing Levels from Ohio Payroll Data to OSCAR– Consistency of Quartile Staffing Measures (Based on Total Hours per Resident Day)

	OSCAR data			
Payroll data	**Lowest quartile**	**Second quartile**	**Third quartile**	**Highest quartile**
Lowest quartile	52%	28%	16%	4%
Second quartile	25%	42%	25%	8%
Third quartile	8%	16%	32%	44%
Highest quartile	16%	13%	25%	46%

N= 98
Sources: Ohio payroll data, OSCAR

Table 7.3A:
Comparison of Reported RN Staffing Levels from Ohio Payroll Data to OSCAR– Consistency of Quartile Staffing Measures (Based on RN Hours per Resident Day)

	OSCAR data			
Payroll data	**Lowest quartile**	**Second quartile**	**Third quartile**	**Highest quartile**
Lowest quartile	58%	29%	4%	8%
Second quartile	20%	40%	32%	8%
Third quartile	16%	24%	52%	8%
Highest quartile	4%	8%	12%	75%

N= 98
Sources: Ohio payroll data, OSCAR

Table 7.3B:
Comparison of Reported LPN Staffing Levels from Ohio Payroll Data to OSCAR– Consistency of Quartile Staffing Measures (Based on LPN Hours per Resident Day)

	OSCAR data			
Payroll data	**Lowest quartile**	**Second quartile**	**Third quartile**	**Highest quartile**
Lowest quartile	63%	17%	8%	12%
Second quartile	32%	60%	8%	0%
Third quartile	0%	20%	72%	8%
Highest quartile	4%	4%	13%	79%

N= 98
Sources: Ohio payroll data, OSCAR

Table 7.3C:
Comparison of Reported Nurses Aide Staffing Levels from Ohio Payroll Data to OSCAR– Consistency of Quartile Staffing Measures (Based on Nurses Aide Hours per Resident Day

	OSCAR data			
Payroll data	**Lowest quartile**	**Second quartile**	**Third quartile**	**Highest quartile**
Lowest quartile	54%	17%	21%	8%
Second quartile	16%	56%	16%	12%
Third quartile	24%	16%	44%	24%
Highest quartile	13%	13%	21%	54%

N= 98
Sources: Ohio payroll data, OSCAR

7.4.3 Comparison of Staffing Levels From the Period Covered by OSCAR to the Preceding Period

It is commonly believed that some facilities, particularly ones with low staffing levels, increase the number of staff immediately prior to the start of the annual certification survey, and then decrease staffing after the survey period ends. Since OSCAR staffing data cover the two-week period preceding the annual survey, if facilities "staff-up" in anticipation of the annual certification survey, then the staffing levels reported in OSCAR may be higher than the typical staffing levels at the facility.

To measure the extent to which facilities increase staffing during the survey period, total nursing staff payroll hours per resident day using Ohio payroll data from the survey period to were compared to a second time period that, where available, covering six months prior to the most recent facility survey.

Little evidence was found that facilities, even those with low staffing levels in the pre-survey period, increased staffing levels during the OSCAR assessment period. Staffing levels were relatively stable across the two time periods, although facilities with low staffing levels in the pre-survey period were more likely to have higher staffing levels during the survey period.

- Mean total hours per resident day were slightly higher during the survey period (Table 7.4). Overall, 51% of facilities had higher total hours per resident day in the pre-survey period (Table 7.5), although the differences were often small (Figure 5).

- Average RN hours were almost identical in the survey and pre-survey periods, while mean LPN hours were somewhat higher in the survey period (Table 7.4, Figure 6). Across all facilities, only 39% had higher RN hours in the survey period, while 52% had higher LPN hours (Table 7.5).

Of the facilities with higher staffing in the OSCAR period, most of the increases were small (Figure 5). Only 16 facilities had an increase in total hours per resident day of 10% or more. Nineteen facilities had a decrease of 10% of more.

Note that while there was no evidence from the payroll data that facilities increased staffing around the period covered by OSCAR, this does not necessarily contradict with the anecdotal evidence that some facilities increase the number of staff immediately prior to the start of the annual certification survey (which is the period covered by OSCAR). It may be that facilities increase staffing in ways that do not appear in the payroll data, such as bringing in staff from other facilities or using administrative staff to provide patient care. These additional staff would be irrelevant to this analysis, since they would not be recorded in either OSCAR, which covers the two weeks preceding the survey, or in the payroll data. These additional staff would not be recorded in either OSCAR or the payroll data.

The investigators expected that facilities with low staffing levels would be more likely to increase staffing in anticipation of the annual certification survey. As a result, the investigators analyzed how staffing levels changed for low-staffed facilities. There was more evidence of increases in staffing corresponding to the survey period for these facilities, although it is not possible to determine whether this is due to anticipation of the survey assessment period or regression to the mean.

- Among the 50 lowest staffed facilities (based on the pre-survey period), mean total hours per resident day were 0.06 (just over 2%) higher in the survey period (Table 7.4). Among these facilities, 63% had higher hours per resident day in the survey period and 8 had higher hours per resident day in the preceding period (Table 7.5), although only 41% reported higher RN hours.

- Among facilities in the lowest quartile in total hours per resident day, total hours per resident day were 2.36 in the pre-survey period and 2.43 during the Survey period, a difference of about 3% (Table 7.4). Sixty-five percent of these facilities had higher total staffing during the Survey period (Table 7.5), although only 39% increased RN staffing.

- Among the lowest 10 staffed facilities (based on the pre-survey period), average total hours per resident day were 2.3 during the survey period and 2.0 in the preceding period, an average increase of 15 percent. There were increases in all three labor categories, and the largest increase was for RNs, which increased from 0.31 to 0.42 hours per resident day (Table 7.4). Nine of these facilities had higher staffing during the survey period, but most of the changes were small. Among these facilities, the largest change in total hours per resident day were at a facility where total hours per resident day increased from 2.02 to 3.61. At the facility with the second largest increase, total hours per resident day increased from 1.93 to 2.17 (Figure 5). It is not possible to determine whether these increases were due to “staffing-up” or other factors, such as regression to the mean.

Comparison of the two payroll periods does not support any adjustment to the staffing levels reported in OSCAR. Except for a few facilities, staffing levels during the survey period were not any higher than staffing levels during the pre-survey period, and staffing was actually lower during the survey period for nearly 50% of facilities.

Figure 7.5: Comparison of total hours per resident day from survey and pre-survey periods

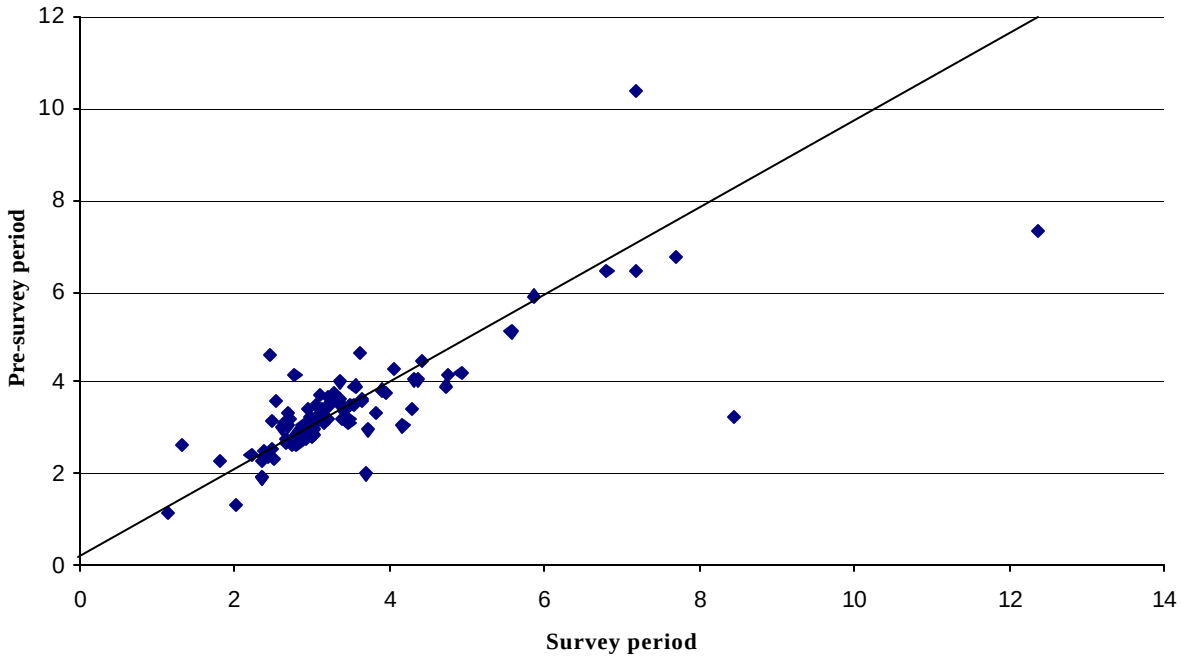

Figure 7.6: RN hours per resident day in survey and pre-survey periods

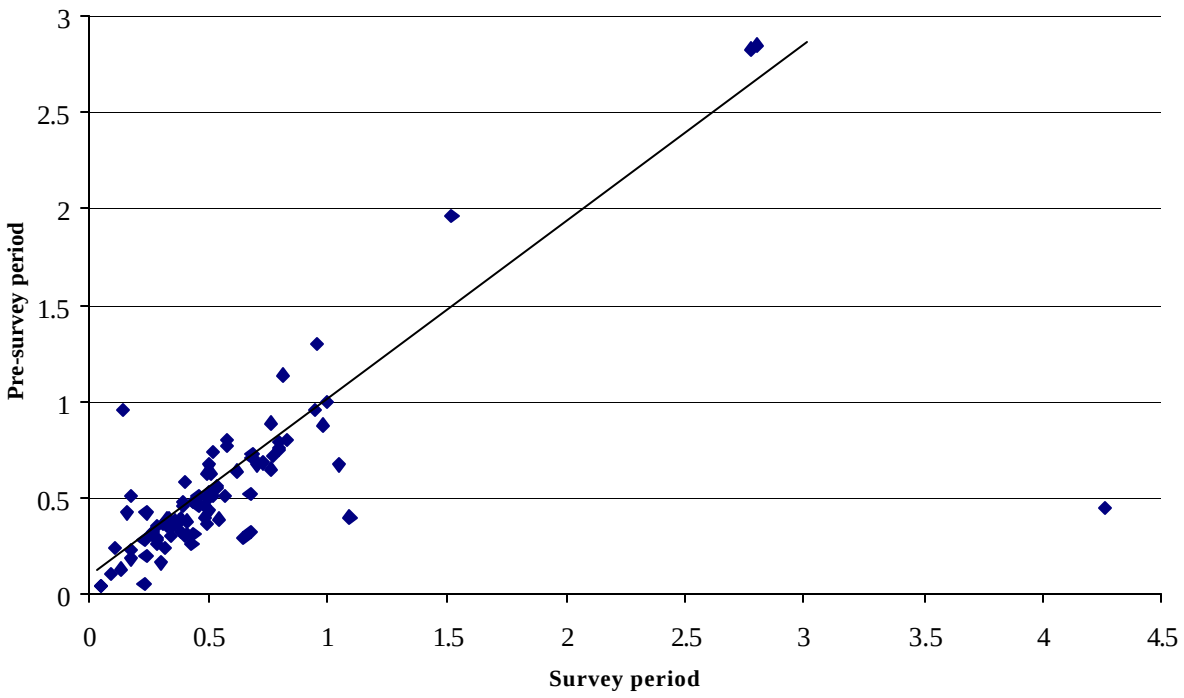

Table 7.4:
Comparison of Reported Staffing Levels from Ohio Payroll Data from OSCAR Assessment Period (Survey Period) and Preceding Period (Pre-Survey Period)

Staffing measure	**Pre-survey period**		**Survey period**	
All facilities	**mean**	**std dev**	**mean**	**std dev**
Total hours per resident day	3.44	1.26	3.49	1.57
RN hours per resident day	0.55	0.44	0.57	0.58
LPN hours per resident day	0.75	0.41	0.83	0.62
Nurses aide hours per resident day	2.15	0.81	2.08	0.78
Lowest 50 in total nursing hours per resident day (in pre-survey period)				
Total hours per resident day	2.69	0.47	2.75	0.56
RN hours per resident day	0.38	0.15	0.41	0.18
LPN hours per resident day	0.59	0.22	0.63	0.28
Nurses aide hours per resident day	1.72	0.42	1.72	0.44
Lowest quartile in total nursing hours per resident day (in pre-survey period)				
Total hours per resident day	2.36	0.44	2.43	0.53
RN hours per resident day	0.39	0.15	0.42	0.22
LPN hours per resident day	0.53	0.20	0.56	0.25
Nurses aide hours per resident day	1.44	0.40	1.43	0.43
Lowest 10 in total nursing hours per resident day (in pre-survey period)				
Total hours per resident day	2.00	0.44	2.30	0.64
RN hours per resident day	0.31	0.09	0.42	0.30
LPN hours per resident day	0.51	0.22	0.60	0.28
Nurses aide hours per resident day	1.18	0.44	1.27	0.47

Notes: **^**: These data were unavailable for one facility. Where available, data were collected for the period six months prior to the period covered by OSCAR.
N= 92 (Some facilities omitted from this analysis because pre-survey period data were unavailable.)
Sources: Ohio payroll data.

Table 7.5:
Comparison of Reported Staffing Levels from Ohio Payroll Data from OSCAR Assessment Period and Preceding Period– Percentage of Facilities with Higher Staffing Levels in Survey Period

All facilities	**Percentage of facilities with higher staffing in survey period**
Total hours per resident day	51%
RN hours per resident day	39%
LPN hours per resident day	52%
Nurses aide hours per resident day	41%
Lowest 50 in total nursing hours per resident day (in pre-survey period)	
Total hours per resident day	63%
RN hours per resident day	41%
LPN hours per resident day	54%
Nurses aide hours per resident day	48%
Lowest quartile in total nursing hours per resident day (in pre-survey period)	
Total hours per resident day	65%
RN hours per resident day	39%
LPN hours per resident day	61%
Nurses aide hours per resident day	57%
Lowest 10 in total nursing hours per resident day (in pre-survey period)	
Total hours per resident day	90%
RN hours per resident day	50%
LPN hours per resident day	80%
Nurses aide hours per resident day	60%

N=92 (Some facilities omitted from this analysis because pre-survey period data were not available.
Sources: Ohio payroll data

7.5 Developing Exclusion Criteria for OSCAR Data

Comparison of staffing measures from OSCAR to those from Ohio payroll data showed sometimes large discrepancies in staffing measures, demonstrating the importance of developing a set of exclusion criteria for facilities with unreliable OSCAR data. To identify a subset of facilities with reliable OSCAR staffing data, two general types of decision rules are proposed:

- A set of "logical decision rules" that identify facilities with fairly obvious data errors. Many of the proposed logical decision rules are similar to those developed by Charlene Harrington. Facilities with data that fail one or more of the logical decision rules should be excluded from analyses, at least for data for the period that failed the logical decision rules.

- A set of decision rules that are based on the consistency of reported staffing and resident levels across time. Implementation of these decision rules requires data from at least two periods or two data sources. Use of these decision rules means that exclusion decisions need not be based on the facility's actual staffing *level* (except for extreme outliers that represent obvious data errors), but rather in the *consistency* of staffing measures (either across time, or, if staffing data from a second source are available, across data sources for a given time period). The longitudinal decision rules focus on the two items– total nursing hours and total residents– that are used to calculate nursing hours per resident day.

The use of longitudinal OSCAR data (or data from a second source if available) to develop exclusion criteria is the major difference between Abt's decision rules and those of Harrington. Harrington excluded facilities with staffing levels in the lower 1% or the upper 2%, regardless of whether these figures were consistent with other data for the facility. The logical decision rules developed here eliminate extreme outliers using a somewhat different threshold than that of Harrington, and are supplemented by the decision rules based on across-time changes in staffing levels or resident counts. They result in the exclusion of some facilities that do not have outlier staffing values, but do have staffing or resident figures that are inconsistent with other data for the facility.

Use of a set of decision rules that is based on *change* in reported staffing levels rather than the actual *level* of staffing better allows the distribution of staffing levels to be preserved, permitting low-staffed facilities with reliable data to be included in the analysis. Except in the case of extreme outliers, which represent obvious data errors, reliability judgments were based on the based on across-time consistency of the staffing and resident count variables that are used to calculate staffing measures on a per resident day basis.

The investigators do not recommend implementation of several of the decision rules developed by Harrington. Using her decision rules, all facilities in the lowest 1% or highest 2% in staffing levels (per resident day) are excluded. While data for most facilities that report low staffing levels is likely

inaccurate, automatic exclusion of low-staffed facilities is particularly inappropriate for the current study, which is analyzing the relationship between staffing levels and resident outcomes, a relationship that might only be evident for facilities with very low staffing levels. Exclusion of extreme outliers, combined with exclusion of facilities with large changes in staffing levels across time, allows data for a subset of low-staffed facilities with validated staffing data to remain in the analysis sample.

The investigators also recommend against using Harrington's rule to exclude non-hospital based facilities with 50 or more empty beds. The current analyses suggested that staffing data for these facilities were no less reliable than for other facilities (based on comparison to OSCAR data from different time periods or to staffing measures from Medicaid Cost Report data; the payroll sample is too small to draw any conclusions about the appropriateness of this decision rule). After applying Abt's logical decision rules, the correlation between total hours per resident day figures from 1997 OSCAR and Medicaid Cost Report data was 0.37 for non-hospital based facilities affected by Abt's decision rules compared to 0.28 for other non-hospital based facilities.

Given that the staffing measure, hours per resident day, depends both on the number of FTEs reported in OSCAR and the number of residents at the facility, it is important to have exclusion criteria to identify facilities with inaccurate resident count data. The investigators propose a decision rule that is based on the change in residents across time (relative to changes in the number of beds at the facility).

7.5.1 Logical Decision Rules

1. Exclude facilities that report more residents than beds This decision rules is designed to identify facilities with questionable resident count information. Nationwide, much less than 1% of facilities reported more residents than beds (Table 7.6). No facilities in the payroll sample were affected by this decision rule, which was also used by Harrington. Because few facilities were affected by this decision rule, it had no affect on the correlation of 1997 OSCAR staffing figures to those from either 1996 OSCAR or 1997 Cost Report data (Table 7.7).

2. Exclude facilities that report no RN hours and have 60 or more beds Current minimum federal standards require that all certified nursing homes with 60 or more beds have an RN on duty for 8 hours a day seven days a week and a licensed nurse (either an RN or an LPN) on duty evenings and nights. RN Directors of Nursing do not count towards this requirement. Facilities with fewer than 60 beds can obtain a waiver that exempts them from this requirement.

As a result, the reliability of OSCAR data for facilities with more than 60 beds that report no RN hours per resident day is questionable. Nationwide, about 1% of facilities were affected by this decision rule. This decision rule had no affect on the correlation of total hours per resident day figures (Table 7.7).

3. Exclude facilities that report more than 12 hours per resident day Development of this threshold was guided by analysis of whether the data in OSCAR could be validated based on data from another time period or from the Medicaid Cost Reports. Harrington et al. used a slightly higher threshold, but data for no facilities reporting twelve or more total nursing hours per resident day could be validated using the Ohio payroll or Medicaid Cost Report data. The across-time correlations for OSCAR data for these facilities was also low. Nationwide, about 3% of facilities reported more than 12 hours per resident day. Only one facility in the payroll sample was reported with more than 12 hours per resident day– a facility that had 2.98 hours per resident day in the payroll data, compared to more than 13 hours per resident day in OSCAR.

Of the facilities that reported more than 12 hours per resident day in OSCAR, none reported more than 5.3 hours per resident day in the Medicaid Cost Report data. Forty percent of the facilities affected by this decision rule were hospital-based and Medicaid Cost Report data were unavailable for most hospital-based facilities. There were only eight facilities with more than 12 hours per resident day in OSCAR for which Medicaid Cost Report data were available. As a result, The investigators focused on the across-time consistency of OSCAR data in developing this decision rule.

Nationwide, among facilities that reported more than 12 hours per resident day in either 1997 or 1998, the Pearson correlation coefficient between 1997 and 1998 hours per resident day was 0.34, compared to 0.72 for facilities that did not report more than 12 hours per resident day in either year (based on comparison of the first and fourth rows of Table 7.7)[5]. Application of this decision rule had a large impact on the consistency of OSCAR staffing measures. Use of the rule increased the correlation in 1997 total staffing between the Medicaid Cost Report data and OSCAR from 0.13 to 0.49 (Table 7.7).

4. Exclude facilities that report less than 0.5 total hours per resident day One goal in the development of decision rules was to avoid excluding facilities with low staffing levels reported simply because of the level of their staffing. The investigators were, however, unable to validate OSCAR data for any facilities reporting less than 0.5 total hours per resident day using Medicaid Cost Report data, suggesting that these facilities should be excluded. One facility in the payroll sample that was affected by this decision rule, and the payroll data reported that this facility had 2.55 total hours per resident day. The decision rule affected 0.3% of facilities in the nationwide OSCAR data (Table 7.6). Application of this decision rule had little effect on the consistency of OSCAR staffing measures, either across time or across data sources (Table 7.7).

Overall, the logical decision rules resulted in a large increase in the across-time and across-data source consistency of OSCAR staffing figures–

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[5] The correlation for facilities with between 12 and 24 total hours per resident day was 0.29, suggesting that staffing figures for these facilities tended to be unreliable relative to facilities with lower staffing levels.

- Without the decision rules, the Pearson correlation coefficient between 1996 and 1997 total hours per resident day from OSCAR was 0.33. This increased to 0.73 after excluding facilities identified by the logical decision rules.

- The Pearson correlation between OSCAR and Medicaid Cost Report increased from 0.13 to 0.49 after applying the decision rules to the OSCAR data. Most of the increase was the result of excluding facilities that reported more than 12 hours per resident day.

- Comparisons based on the payroll sample are limited by the small number of facilities for which payroll data were available, but application of the logical decision rules improved the OSCAR-payroll data correlation from 0.41 to 0.54 (Table 7.8).

Table 7.6:
Nationwide Proportion of Facilities Affected by Logical Decision Rules

Decision rule	% of facilities affected			
	1996	**1997**	**1998**	**1999**
Exclude facilities that report more residents than beds	0.01%	0.02%	0.03%	0.02%
Exclude facilities that have more than 60 residents and no RN hours	1.3%	1.1%	1.0%	1.1%
Exclude facilities that report more than 12 hours per resident day	3.9%	3.4%	3.2%	2.7%
Exclude facilities that report fewer than 0.5 hours per resident day	0.3%	0.3%	0.3%	0.3%
Total	5.4%	4.7%	4.5%	4.1%

N= 1996: 16,176; 1997: 16,074; 1998: 15,319; 1999: 8,117
Sources: OSCAR (Nationwide data). 1999 OSCAR data were available only through June 1999.

Table 7.7:
Correlation between 1997 OSCAR and other OSCAR and Medicaid Cost Report data with and without application of logical decision rules

Decision rule	Pearson Correlation coefficient of 1997 OSCAR total hours per resident day to:	
	1996 OSCAR^	1997 Medicaid Cost Report
No logical decision rules applied	0.33	0.13
Exclude facilities that report more residents than beds	0.33	0.13
Exclude facilities that no report zero RN hours and 60 or more beds	0.33	0.13
Exclude facilities that report more than 12 hours per resident day	0.71	0.48
Exclude facilities that report fewer than 0.5 hours per resident day	0.33	0.13
All logical decision rules applied	0.73	0.49

^: Logical decision rules applied to both 1996 and 1997 data.
N= 1,474 facilities with 1997 OSCAR and Medicaid Cost Report data; 1,985 facilities with 1996 and 1997 OSCAR data.
Sources: OSCAR data for New York, Ohio, and Texas

Table 7.8:
Correlation Between OSCAR and Ohio Payroll Data With and Without Application of Logical Decision Rules

Decision rule	Correlation coefficient of OSCAR total hours per resident day to payroll data
No logical decision rules applied	0.41
All logical decision rules applied	0.54

N= 98
Sources: OSCAR data, Ohio payroll sample

7.5.2 Decision Rules Based on Changes in Staffing or Resident Levels Across Time

A second set of decision rules was developed to identify facilities that had large changes in reported staffing levels or number of residents (adjusted for changes in the number of beds) across time. Staffing and resident levels for most facilities remain stable over time, and data for facilities reporting large changes in these values are suspect. If a second data source that is less than a "gold standard" (e.g., Medicaid Cost Report or some other self-reported data) are available, these data can be used to validate staffing or resident changes across time. If only OSCAR data are available, then The investigators recommend excluding all facilities with changes in total residents or total hours per resident day beyond a given threshold. Implementation of these decision rules requires data from at least two time periods.

1. Exclude all facilities that had a change in total residents of 25 or more, unless the facility reported a corresponding change in beds. Invalid staffing data (expressed in terms of hours per resident day) can result from inaccurate resident count information. Analysis of changes in resident count across time (adjusted for anticipated changes that result from changes in the number of beds at the facility) can identify facilities with questionable resident count data.

The two periods of payroll data that were collected did not cover the same time interval as longitudinal OSCAR data, but showed that the number of residents at a facility tends to remain relatively stable across time. The correlation in the patient day measures for the two payroll periods was 0.75. While there are undoubtedly facilities that experience large changes in resident counts, among facilities that report large changes in staffing levels across time there is likely a disproportionate share with errors in the OSCAR data.

The decision rule that is proposed is to *exclude all facilities that had a change in total residents of 25 or more, unless the facility reported a corresponding change in beds.* To implement this decision rule, one must create a measure of 'expected residents,' which equals the resident count in the preceding period adjusted for the change in beds between the two periods.

This decision rule affected 3% of facilities, about 3% of the sample, excluding facilities affected by the logical decision rules described above (Table 7.9). Application of this decision rule appears to greatly improve the reliability of OSCAR data:

- The correlation between 1996 and 1997 OSCAR total hour per resident day figures was 0.77 for facilities that did not have a large change in total residents (i.e., not affected by this decision rule), after excluding facilities affected by the logical decision rules, relative to 0.73 with only the logical decision rules applied (Table 7.10) The correlation for facilities excluded by this decision rule was 0.54 (Table 7.11).

- The correlation between 1997 total hour per resident day figures derived from OSCAR and Medicaid Cost Report data was 0.50 for facilities not affected by this decision rule (after excluding facilities affected by the logical decision rules), compared to 0.22 for facilities affected by the rule (Table 7.11). This was a small increase in consistency relative to using only the logical decision rules (Table 7.10).

2. Exclude facilities in the top 10% in terms of change in total hours per resident day across time periods The final decision rule excludes facilities with large changes in reported staffing levels across time. While some facilities have large changes in staffing levels across time, large changes more likely reflect the presence of errors in the OSCAR data. If there is a second source of staffing data available, it can be used to validate staffing changes, but if OSCAR is the only data source available then facilities with large changes in staffing levels across periods should be excluded.

To apply this decision rule, the facility's *percentile rank* in total hours per resident day needs to be calculated. This can be done using PROC RANK in SAS with the GROUPS=100 option. Percentile rank, rather than actual staffing levels, was used as the basis for this decision rule so that the decision rule is applied independently of facilities' staffing levels. Facilities in the top 10% in terms of *change* in total hours per resident day are excluded based on this decision rule. (Note that selection of a threshold is somewhat arbitrary and depends partly on the available sample size and the purpose for which OSCAR data are being used.)

Application of this rule appears to result in substantial improvements in the reliability of OSCAR data–

- By definition, exclusion of facilities with changes in staffing will lead to improvement in the correlation of OSCAR staffing measures across periods, and such a comparison is not particularly useful.

- A better test of this decision rule is to compare staffing measures from OSCAR to those from either the Medicaid Cost Report or payroll data. The correlation between 1997 data from OSCAR and Medicaid Cost Reports was 0.50 for facilities without large across-time changes in staffing level, compared to 0.10 for facilities excluded as a result of this rule (Table 7.11).

7.5.3 Overall Impact of Decision Rules

Overall, 16% of facilities are excluded by the decision rules described above (based on 1997 OSCAR data). The decision rules affected 11% of the payroll sample. Application of these decision rules results in an analytic sample that has much greater reliability and validity than results from using uncleaned OSCAR data.

- The correlation in total hours per resident day from 1996-1997 OSCAR data was 0.85 after applying the decision rules, compared to 0.33 without using any of the decision rules (Table 7.10).
- The correlation in 1997 total hours per day from OSCAR and the Medicaid Cost Report data improved from 0.13 to 0.55 after excluding facilities based on the decision rules.

- The correlation for the relatively small number of facilities with both OSCAR and Ohio payroll data improved from 0.43 to 0.54 after applying the decision rules (Table 7.12). The correlation went from 0.43 to 0.57 using only the logical decision rules, and then decreased slightly after also applying the decision rule based on the change in total hours per resident day. Given the small number of facilities in the payroll sample, it is more appropriate to evaluate the impact of this decision rule using the OSCAR-Medicaid Cost Report comparisons, for which a much larger sample was available.

Table 7.9:
Nationwide Proportion of Facilities Affected by OSCAR Decision Rules

Decision rule			
	1997	**1998**	**1999**
Logical decision rules only	4.7%	4.5%	4.1%
Exclusion based on change in total hours per resident day	10.1%	10.0%	10.1%
Exclusion based on change in total residents (relative to change in number of beds)	2.7%	2.8%	2.3%
Apply all decision rules: exclusion based on change in total hours, change in total residents, and logical decision rules	14.6%	14.4%	12.8%

N= 1996: 16,176; 1997: 16,074; 1998: 15,319; 1999: 8,117
Sources: OSCAR (Nationwide data). 1999 OSCAR data were available only through June 1999.

Table 7.10:
Correlation Between 1997 OSCAR and Other OSCAR and Medicaid Cost Report Data With and Without Application of Logical and Longitudinal-Based Decision Rules

Decision rule	Pearson Correlation coefficient of 1997 OSCAR total hours per resident day to:	
	1996 OSCAR	1997 Medicaid Cost Report
No logical decision rules applied	0.33	0.13
All logical decision rules applied	0.73	0.49
Exclusion based on change in total hours per resident day and logical decision rules	0.84	0.50
Exclusion based on change in total residents (relative to change in number of beds) and logical decision rules	0.77	0.54
Apply all decision rules: exclusion based on change in total hours, change in total residents, and logical decision rules	0.85	0.55

N= 1,474 facilities with 1997 OSCAR and Medicaid Cost Report data; 1,985 facilities with 1996 and 1997 OSCAR data.
Sources: OSCAR data for New York, Ohio, and Texas

Table 7.11:
Correlation Between 1997 OSCAR and 1997 Medicaid Cost Report Data Stratified by Whether Facility Is Excluded by OSCAR Decision Rules

Decision rule	Pearson Correlation coefficient of 1997 OSCAR and Medicaid Cost Report total hours per resident day	
	Included facilities	Excluded facilities
No logical decision rules applied	0.13	N/A
Apply all logical decision rules	0.49	0.07
Exclusion based on change in total hours per resident day (using logical decision rules for both included and excluded facilities)	0.50	0.30
Exclusion based on change in total residents (relative to change in number of beds) (using logical decision rules for both included and excluded facilities)	0.54	0.10
Apply all decision rules: exclusion based on change in total hours, change in total residents, and logical decision rules	0.55	0.29

N= 1,474 facilities with 1997 OSCAR and Medicaid Cost Report data
Sources: OSCAR data for New York, Ohio, and Texas

Table 7.12:
Correlation Between OSCAR and Ohio Payroll Data With and Without Application of Logical and Longitudinal-Based Decision Rules

	Pearson correlation coefficient of OSCAR total hours per resident day to Ohio payroll data
No logical decision rules applied	0.43
All logical decision rules applied	0.57
Exclusion based on change in total hours per resident day and logical decision rules	0.54
Exclusion based on change in total residents (relative to change in number of beds) and logical decision rules	0.57
Apply all decision rules: exclusion based on change in total hours, change in total residents, and logical decision rules	0.54

N= 98
Sources: OSCAR, Ohio payroll data

7.6 Conclusion

This chapter analyzed the reliability and accuracy of OSCAR staffing measures, based on comparison to payroll data from a sample of Ohio facilities. These analyses showed that there were a significant number of facilities for which there were differences in staffing measures from the two data sources. The correlation between staffing figures from OSCAR and the payroll data was relatively low. For total hours per resident day, the Pearson correlation coefficient was 0.43, and the Spearman (rank) correlation was 0.52. There was less consistency in nurses aide staffing figures than for either RNs or LPNs.

This study also investigated whether facilities, particularly ones with low staffing levels, tended to increase staffing levels (particularly for RNs) immediately prior to the start of the annual certification survey. Since OSCAR staffing data cover the two-week period preceding the annual survey, if facilities "staff-up" in anticipation of the annual certification survey, then the staffing levels reported in OSCAR may be higher than the typical staffing levels at the facility. The Ohio payroll data included two time periods, one corresponding to the survey period and a second that typically covered the period six months prior to the most recent facility survey. Little evidence was found to suggest that this type of "staffing-up" is a widespread phenomenon. Staffing levels were relatively stable across the two time periods, although facilities with low staffing levels in the pre-survey period were more likely to have higher staffing levels during the survey period. It is not possible to determine whether this reflects some type of increased staffing corresponding to the survey period or merely reversion to the mean.

A set of decision rules were developed for determining which facilities should be excluded from analyses due to concerns about the accuracy of OSCAR staffing measures. These decision rules build on those developed by Charlene Harrington, but also consider changes in staffing levels across time in assessing reliability.

Overall, 16% of facilities are excluded by the decision rules described above (based on 1997 OSCAR data). Application of these decision rules results in an analytic sample that has much greater reliability and validity than results from using uncleaned OSCAR data. The correlation in 1997 total hours per day from OSCAR and the Medicaid Cost Report data improved from 0.13 to 0.55 after excluding facilities based on the decision rules. The correlation for the relatively small number of facilities with both OSCAR and Ohio payroll data improved from 0.43 to 0.54 after application of the decision rules.

The investigators recommend that the decision rules described above be applied to all analyses that use OSCAR for which data from at least two time periods are available. If no longitudinal data are available, use of the logical decision rules will result in considerable improvement in the reliability of data in the analytic sample, but will not capture facilities with large unexplained changes in either staffing levels or resident counts.

References

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